

REMARKS

Summary

Claims 1-5, 8-12, and 21-22 were pending, and all of the claims were rejected in the Office action. Claims 6, 7 and 13-20 had previously been withdrawn in response to a restriction requirement. Claims 1, 3-4, and 10-11 have been amended; Claim 21 has been cancelled; new Claims 23-34 are presented. No new matter has been introduced. Claims 1-5, 8-12 and 22-34 are pending after entry of this amendment. The Applicants have carefully considered the reference and the reasons for rejection advanced by the Examiner and respectfully traverse the rejections in view of the amendments and the discussion presented below.

Amendments

Specification and Drawings

The Applicants have noted a number of typographical errors in the representation of a chemical formula in the specification. Ta_2O_5 has been incorrectly written as Ta_2O_3 . The chemical formula is given correctly, for example, at page 2, line 10. Rewritten paragraphs are provided. In Fig. 7, Ta_2O_5 has been incorrectly written as Ta_2O_6 . Fig. 7, with the correction marked in red ink, is appended. A formal drawing will be provided after a Notice of Allowance issues.

Claim Rejections

35 U.S.C. § 102 (b)

Claims 1-2, 4, 8, 11, and 21-22, were rejected under 35 U.S.C. § 102 (b) as being anticipated by Chang et al. (US 5,719, 730; "Chang").

Amended Claim 1 recites, *inter alia*, a thin film magnetic head, wherein the gap layer comprises a SiON film, and the amount of protrusion of the gap layer from the facing surface is less than or equal to 3.5 nm.

An advantage in selecting SiON as the material for forming the gap layer is that excess portions of the gap layer can be removed by reactive ion etching to permit trimming of the upper and lower core layer in order to prevent the occurrence of side fringing in writing of a recording signal on the recording medium. However, the thin film magnetic head may not have an advantage of permitting the distance between the magnetic head and the recording medium to decrease as the magnetic recording density is increased unless the protrusion of the gap layer from the facing surface can be reduced.

In rejecting Claim 1, the Examiner states (Office action, page 3, lines 1-4) that "the amount of protrusion of the insulating gap layer is inherently less than 3.5 nm (or less than or equal to about 3 nm as per claims 21 and 22). This inherency is based on the material of the gap layer (18) which is disclosed as silicon oxynitride (SiON)." The Applicants respectfully submit that the projection distance recited in the arrangement of Claim 1 is not inherent in SiON. On the contrary, the projection distance limitation is a consequence of the material properties of SiON only within a narrow range of concentrations of N. So, if conventional SiON is used as a gap layer material, this does not inevitably lead to the arrangement recited in Claim 1.

Chang is directed towards the reduction of track width and forming a low fringing field magnetic recording head. Nothing in Chang suggests that the proximity between the magnetic head and the magnetic medium would be limited by the protrusion of any layer of material from the facing surface. The significance of the distance between the magnetic head and the magnetic medium is not even mentioned. Yet, a protrusion of material from the facing surface would limit the minimum distance if destructive contact is to be avoided. Therefore it is submitted that Chang did not recognize this limitation, and would have no motivation to select specific material properties to limit the protrusion of the layer.

In rejecting Claim 2 the Examiner stated that the inherency of the Young's modulus value is based on the material of the gap layer (18) which is disclosed as silicon oxynitride (SiON) (Office action, page 3, first full paragraph). The Applicants respectfully submit that it is not inherent to SiON that the Young's modulus meets the restriction in Claim 2, and there is no suggestion in the reference that SiON has any particular mechanical properties. Claim 2 recites a specific mechanical property of the gap layer. Young's modulus lying in the range $E > 123.2$ (GPa) is not an invariant property of a SiON layer. This may be seen from the experimental data shown in Fig. 6 which is an experimental plot of Young's modulus (E) as a function of the N content of the SiON film (in at %). The Young's modulus is seen to reach a peak value of approximately 139 GPa, corresponding to a N content of 4 (at %), and to decline steeply when the N is greater than 6. So, at some greater value of N, the Young's modulus will fall to 123.2 GPa, and SiON will no longer be a suitable gap-layer material in accordance with the arrangement of Claim 2. The choice of a specific minimum value of Young's modulus is based on the experimental results shown in Fig. 7, where the protrusion of the insulation layer after lapping is related to the Young's modulus, and a value greater than 123.2 (GPa) is correlated with a protrusion of 3.5 nm or less. There is no teaching or suggestion in Chang that there is a relationship between the protrusion of the gap layer after lapping and the Young's modulus of the gap layer, nor does the reference suggest that the gap layer have any special mechanical properties.

Under principles of inherency, when a reference is silent about an asserted inherent characteristic, it must be clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. *Continental Can Co. v. Monsanto Co.*, 948 F.2d 1264, 1268, 20 USPQ2d 1746, 1749 (Fed. Cir.1991). "Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient." (*In re Oelrich*, 666 F.2d 578, 581, 212 USPQ 323, 326 (CCPA 1981))

(quoting *Hansgrig v. Kemmer*, 26 CCPA 937, 940, 102 F.2d 212, 214, 40 USPQ 665, 667 (1939)). The only evidence of the mechanical properties of the SiON layer or the projection distance of the layer advanced by the Examiner is that which is contained in the Applicants' disclosure. The Applicants respectfully submit that there is no suggestion in the reference that the Young's modulus of the SiON layer be $E > 123.2$ (GPa) or that a projection distance of 3.5 nm or less would result and, absent such suggestions, the quantitative limitations recited in the present claims would not have been recognized by one skilled in the art; therefore Claims 1 and 2 are not anticipated. For similar reasons, Claim 8 is not anticipated.

The reasoning set forth above applies also to Claim 4, where the Young's modulus $E \geq 127.4$ (GPa) is shown to be achieved over a an even smaller range of concentration of N (see Fig. 6) and is therefore not inherent to SiON. Claim 4 is thus not anticipated and is independently allowable.

In addition, Claims 2-5, 9-12 and 22, being dependent on allowable base claims are, without more, allowable.

35 U.S.C. § 103(a)

Claims 3, 5, 10 and 12 were rejected under U.S.C. §103 (a) as being unpatentable over Chang. In addition to being allowable as claims dependent on an allowable base claim, Claims 3, 5, 10 and 12 are independently allowable. Claim 3 is a representative claim which recites, *inter alia*, a thin film magnetic head, wherein the atomic ratio of N of the SiON film is $0 \text{ (at\%)} < \text{N atomic \%} \leq 6 \text{ (at\%)}$.

The U.S. Court of Customs and Patent Appeals (CCPA) established the rule that "where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA

1955)(citing *In re Swain*, 156 F.2d 239, 70 USPQ 412 (CCPA 1946); *Minnesota Mining and Mfg. Co. v. Coe*, 99 F.2d 986, 38 USPQ 213 (D.C. Cir. 1938); *Allen v. Coe*, 135 F.2d 11, 57 USPQ 136 (D.C. Cir. 1943)). As with many rules, however, there are exceptions to the CCPA's rule. One exception is the case where a "parameter optimized was not recognized to be a result-effective variable" *In re Antonie*, 559 F.2d 618, 621, 195 USPQ 6, 8 (CCPA 1977).

Nothing in Chang suggests that the proximity between the magnetic head and the magnetic medium would be limited by the protrusion of any layer of material from the facing surface, to the extent that the distance between the magnetic head and the magnetic medium is not mentioned. Yet, the protrusion would limit this distance if destructive contact is to be avoided. Therefore it is submitted that Chang did not recognize this limitation, and would have no motivation to select specific material properties to limit the protrusion of the layer.

Further, there is nothing in the reference that suggests that there is an optimum range of concentration of N in SiON with respect to the Young's modulus or the projection of the gap layer, nor has the Examiner provided any reference which suggests that the concentration of N should be optimized. The Examiner suggests that merely routine experimentation would be required, and that the objective would be known to a person of ordinary skill in the art. The motivation to achieve a particular range of Young's modulus or projection distance of the gap layer by varying the concentration of N is based solely on the Applicants' recognition that at least a minimum value of Young's modulus is required in order to limit the protrusion of the gap layer during lapping. Outside of the optimum range disclosed and claimed by the Applicants, the Young's modulus may not be sufficiently high to achieve the desired results. As such, the Examiner has not set forth a *prima facie* case of obviousness, and the Applicants respectfully request that the rejection be withdrawn.

The Examiner states that "the instant disclosure does not set forth the evidence ascribing unexpected results due to the claimed dimensions" citing *Gardiner v. TEC Systems Inc.*, 725 F.2d 1338 (Fed. Cir. 1984), which held that the dimensional limitation failed to point out a feature which performed and operated any differently from the prior art. The Applicants respectfully point out that one advantage of the invention is to reduce the protrusion of the gap layer from the head structure, reducing the possibility that the gap layer collides with the recording medium when the flying head distance is reduced, and that this occurs for a particular range of concentrations of N and values of Young's modulus. The objective evidence for this is provided in Figs. 6, 7 and 8.

In order to make a case of *prima facie* obviousness, it must at least be shown that the reference can be modified in accordance with the suggestion in another reference or in accordance with the skill of an ordinary practitioner in the art.

Since the specific values of N content of the SiON layer are not taught or suggested by Chang, and there is only a specific range of values of N which is satisfactory according to the arrangement recited in Claim 3, for example, a *prima facie* case of obviousness has not been made. Similarly Claims 5, 10 and 12 are not obvious and therefore allowable.

In the rejection of Claims 3, 5, 10 and 12 the Examiner asserts that one of ordinary skill in the art would be able to obtain the results claimed by routine experimentation and optimization. But an experiment must have a purpose in order for these objectives to be achieved, and nothing in the reference suggests that there is a protrusion of the SiON gap layer, and that a certain selection of material properties would result in minimizing the protrusion that exists after the lapping operation. Moreover, there are no indicia that the protrusion of the gap layer is one of the parameters that one skilled in the art would be motivated to optimize. The Applicants respectfully suggest that this is a consequence of the

lack of recognition by the previous art of the problem addressed in this application. In such case, the motivation to explore the possibility of reducing the gap layer protrusion does not exist, and the solution thereto is not obvious.

The Applicant respectfully requests that, in accordance with 37 CFR §1.104(d)(2), if the foregoing arguments are not accepted, that the Examiner provide specific relevant evidence regarding the assertion that the projection distance of the gap layer and the Young's modulus of the gap layer are known result-effective variables.

35 U.S.C. § 112 ¶ 2

The rejection of Claim 22 as not having a positive antecedent basis has been obviated by the amendment to Claim 1 upon which it depends.

Comments on Examiner's Response to Arguments

Many aspects of the Examiner's response to the arguments presented in the paper submitted May 6, 2003 have been addressed above. Particularly with respect to inherency, the Applicants respectfully submit that grounds for rejection have been overcome. Without the experimental results presented in the disclosure, and the teaching of a manufacturing method, it would not have been apparent that there was a relationship between the protrusion of the gap layer and either the Young's modulus or the concentration of N.

The Applicants respectfully traverse the argument set forth by the Examiner on page 6, last paragraph, of the Office action. Absent the teachings in the Applicants' disclosure, the specific material properties needed to achieve the advantages of the present invention would not be apparent to one skilled in the art. The Applicants presented the experimental evidence to support the claims in the disclosure, and specifically identified a composition, Young's modulus E and protrusion distance. In addition, the Applicants disclosed a method of achieving these beneficial results.

New Claims

New Claims 23 and 27 have been introduced as generic claims encompassing both the elected and non-elected species. Claims 24-26 and 28-30 are claims dependent thereon. Claims 33 and 34 are dependent on Claim 1. Claims 31-32 further describe the elected species.

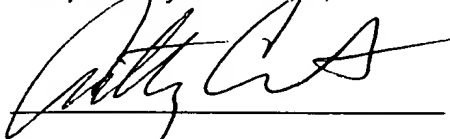
Conclusion

Claims 1-5, 8-12 and 21-22 were pending. Claims 1, 3-4 and 10-11 have been amended; Claim 21 has been cancelled; new Claims 23-34 have been presented. Claims 1-5, 8-12 and 22-34 are pending.

For at least the reasons given above, the Applicants respectfully submit that the pending claims are allowable.

The Examiner is respectfully requested to contact the undersigned in the event that a telephone interview would expedite consideration of the application.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Anthony P. Curtis', is written over a horizontal line.

Anthony P. Curtis, Ph.D.
Registration No. 46,193
Agent for Applicants

BRINKS HOFER GILSON & LIONE
P.O. BOX 10395
CHICAGO, ILLINOIS 60610
(312) 321-4200